



UNITED STATES  
NUCLEAR REGULATORY COMMISSION

WASHINGTON, D.C. 20555-0001

May 21, 2004

Mr. Dae Y. Chung  
Director, Licensing Office  
Environmental Cleanup and Acceleration  
Office of Environmental Management  
Department of Energy  
Washington, DC 20585

SUBJECT: CERTIFICATE OF COMPLIANCE NO. 9253 FOR MODEL NO. TN-FSV

Dear Mr. Chung:

As requested by your renewal application dated April 22, 2004, enclosed is Certificate of Compliance No. 9253, Revision No. 10, for the Model No. TN-FSV. This certificate supersedes, in its entirety, Certificate of Compliance No. 9253, Revision No. 9, dated August 8, 2003. Changes made to the enclosed certificate are indicated by vertical lines in the margin. The staff's Safety Evaluation Report is also enclosed.

Those on the attached list have been registered as users of the package under the general license provisions of 10 CFR 71.12 or 49 CFR 173.471. The approval constitutes authority to use the package for shipment of radioactive material and for the package to be shipped in accordance with the provisions of 49 CFR 173.471.

If you have any questions regarding this certificate, please contact me or Adrienne Lester of my staff at (301) 415-8500.

Sincerely,

A handwritten signature in black ink, appearing to read "J. Monninger", is written over the word "Sincerely,".

John D. Monninger, Chief  
Licensing Section  
Spent Fuel Project Office  
Office of Nuclear Material Safety  
and Safeguards

Docket No. 71-9253

TAC No. L23734

Enclosures: 1. Certificate of Compliance  
No. 9253, Rev. No. 10  
2. Safety Evaluation Report  
3. Registered Users

cc w/encl: R. Boyle, Department of Transportation  
J. Shuler, Department of Energy  
RAMCERTS  
Registered Users

# **CERTIFICATE OF COMPLIANCE FOR RADIOACTIVE MATERIAL PACKAGES**

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. DOCKET NUMBER	d. PACKAGE IDENTIFICATION NUMBER	PAGE	PAGES
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## 2. PREAMBLE

- a. This certificate is issued to certify that the package (packaging and contents) described in Item 5 below meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging and Transportation of Radioactive Material."
- b. This certificate does not relieve the consignor from compliance with any requirement of the regulations of the U.S. Department of Transportation or other applicable regulatory agencies, including the government of any country through or into which the package will be transported.

## 3. THIS CERTIFICATE IS ISSUED ON THE BASIS OF A SAFETY ANALYSIS REPORT OF THE PACKAGE DESIGN OR APPLICATION

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|---|---|
| <p>a. ISSUED TO (<i>Name and Address</i>)</p> <p>U.S. Department of Energy<br/>Washington, DC 20585</p> | <p>b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION</p> <p>Safety Analysis Report for the TN-FSV Package, dated March 31, 1993, as supplemented; Safety Analysis Report Addendum for the Oak Ridge Container in the TN-FSV Packaging, dated June 15, 2001, as supplemented.</p> |
|---|---|

## 4. CONDITIONS

This certificate is conditional upon fulfilling the requirements of 10 CFR Part 71, as applicable, and the conditions specified below.

## 5.

### (a) Packaging

- (1) Model No.: TN-FSV
- (2) Description

A steel and lead shielded shipping cask for irradiated nuclear fuel. The cask has two shipping configurations: Configuration 1 for shipping irradiated Fort St. Vrain high temperature gas cooled reactor (HTGR) fuel elements, and Configuration 2 for shipping irradiated fuel parts and intact irradiated Peach Bottom Unit 1 fuel elements within a secondary containment vessel. The cask is a right circular cylinder, with a balsa and redwood impact limiter at each end. The package has approximate dimensions and weights as follows:

Cavity diameter	18 inches
Cavity length	199 inches
Cask body outer diameter	31 inches
Lead shield thickness	3.44 inches
Package overall outer diameter, including impact limiters	78 inches
Package overall length, including impact limiters	247 inches
Packaging weight (Configuration 1)	42,000 pounds
Gross package weight, including contents (Configurations 1 and 2)	47,000 pounds

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5.(a) (2) Description (Continued)

The cask body is made of two concentric shells of Type 304 stainless steel, welded to a bottom plate and a top closure flange. The inner shell has an ID of 18 inches and is 1.12 inches thick. The outer shell has an OD of approximately 30 inches and is 1.5 inches thick. The annular space between the inner and outer shells is filled with lead. The bottom plate is 5.5-inch thick Type 304 stainless steel. The closure lid is 2.5-inch thick Type 304 stainless steel, and is fully recessed into the cask top flange. The lid is fastened to the cask body by 12, 1-inch diameter closure bolts. The lid is sealed with double O-ring seals with a leak test port. A vent port and drain port are sealed with single O-rings and cover plates. Configuration 1 uses silicone O-ring seals and Configuration 2 uses butyl O-ring seals. The cask body is covered with a stainless steel thermal shield composed of 0.25-inch thick stainless steel plate over a wire wrap. The impact limiters are constructed of balsa and redwood encased in stainless steel shells.

The cask has two lifting sockets bolted to the cask top flange. Two rear trunnions are provided for cask tie-down.

For Configuration 1:

Irradiated hexagonal HTGR fuel elements are shipped in Configuration 1. The fuel elements are stacked in a carbon steel fuel storage container, which has an OD of approximately 17.6 inches and an overall length of 195 inches. The fuel storage container has a 0.5-inch thick shell, a 2.0-inch thick bottom plate, and a 1.5-inch thick lid. The lid accommodates a removable depleted uranium plug.

For Configuration 2:

Irradiated fuel parts and intact Peach Bottom Unit 1 fuel elements are shipped in Configuration 2. Canisters, containing either fuel parts or a single intact Peach Bottom fuel element, are loaded into a separate, secondary containment vessel, the Oak Ridge Container. The Oak Ridge Container is composed of a right circular cylindrical vessel and a basket assembly. The stainless steel vessel has a 10-gage (0.135-inch) wall thickness, an overall length of approximately 198 inches, and an outside diameter of approximately 20 inches at the lid end. The lid is approximately 7 inches thick and is closed by 12, 1/2-inch diameter bolts and two butyl O-ring seals. There is a single penetration through the lid which is closed by a bolted port cover and two butyl O-ring seals. The basket is composed of a series of discs, tie rods, and support tubes, with five fuel compartment tubes arranged in a star-like configuration. The basket incorporates fixed borated aluminum neutron poison plates. Flux trap spacers are positioned axially between stacked fuel parts canisters, and the canisters and spacers are positioned within a stainless steel sleeve that forms the fuel compartment. Canisters containing fuel parts (called Oak Ridge Canisters) and canisters containing intact Peach Bottom fuel elements may be shipped together.

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## 5. (a) (3) Drawings

The TN-FSV packaging is constructed and assembled in accordance with the following Transnuclear, Inc. Drawing Nos.:

1090-SAR-1, Rev. 3	1090-SAR-6, Rev. 3
1090-SAR-2, Rev. 3	1090-SAR-7, Rev. 3
1090-SAR-3, Rev. 3	1090-SAR-8, Rev. 3
1090-SAR-4, Rev. 3	1090-SAR-9, Rev. 3
1090-SAR-5, Rev. 4	1090-SAR-10, Rev. 2

The Oak Ridge Container and internals are constructed and assembled in accordance with the following Transnuclear, Inc. Drawing Nos.:

3044-70-1, Rev. 5	3044-70-6, Rev. 2
3044-70-2, Rev. 3	3044-70-7, Rev. 2
3044-70-3, Rev. 2	3044-70-8, Rev. 1
3044-70-4, Rev. 2	3044-70-9, Rev. 0
3044-70-5, Rev. 2	

The Oak Ridge Canister is constructed and assembled in accordance with the following Lockheed Martin Energy Systems, Inc. Drawing No.:

X3E020566A175, Rev. 0

## (b) Contents

## (1) Type and form of material

(i) For Configuration 1:

Irradiated HTGR fuel elements within a fuel storage container. Each fuel element consists of a graphite block containing fuel rods. The fuel is composed of thorium/uranium carbide and thorium carbide fuel particles within the fuel rods. The graphite block is hexagonal in cross section and is approximately 14.2 inches across the flats and 31.2 inches long. Each fuel element contains a maximum of 1.4 kg of uranium enriched to a maximum of 93.5 weight percent U-235 and approximately 11.3 kg of thorium. The maximum burnup is approximately 70,000 MWd/MTIHM, and the minimum cool time is 1600 days.

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5(b) (1) Type and form of material (Continued)

(ii) For Configuration 2:

Irradiated, intact Peach Bottom Unit 1, Core 2, fuel elements within aluminum canisters with steel liners. Each fuel element consists of stacked graphite annular rings, or compacts, with an inner diameter of approximately 1.75 inches and an outer diameter of approximately 2.75 inches. The fuel is composed of coated thorium/uranium carbide particles within the graphite. The active fuel length is approximately 90 inches. The fuel element may include associated hardware such as top plug, reflector apparatus, grappling hook, etc. Each fuel element contains a maximum of 0.25 kg of uranium enriched to a maximum of 93.15 weight percent U-235 and approximately 1.5 kg of thorium prior to irradiation. The maximum burnup is approximately 73,000 MWd/MTIHM and the minimum cool time is 27 years.

(iii) For Configuration 2:

Irradiated fuel parts within Oak Ridge Canisters, as described in Item No. 5(a)(3), above. The minimum fuel cool time is 15 years. The maximum fissile mass prior to irradiation per Oak Ridge Canister is limited as shown below:

Canister Group	Maximum mass U-235 per canister (grams)	Maximum mass Pu-239 + Pu-241 per canister (grams)
1	475	0
2	865	191
3	200	415
4	275	160
5	910	0

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5.(b) (2) Maximum quantity of material per package

Total weight of contents and packaging material within the TN-FSV cavity not to exceed 5,000 pounds. For Configuration 1 this includes fuel elements, fuel storage container, and depleted uranium shield plug. For Configuration 2 this includes fuel materials, Oak Ridge Container, basket, Oak Ridge Canisters, Peach Bottom fuel canisters, flux trap spacers, and other packaging materials.

(i) For the contents described in Item 5(b)(1)(i):

Six fuel elements, with decay heat not to exceed 60 watts per fuel element.

(ii) For the contents described in Item 5(b)(1)(ii) and 5(b)(1)(iii):

Total weight of fuel materials, canisters, and flux trap spacers within the Oak Ridge Container not to exceed 1,789 pounds. Decay heat not to exceed 120 watts per package. The maximum decay heat per Oak Ridge Canister is 35 watts, except that the maximum decay heat per Oak Ridge Canister in the position next to the lid is 7 watts. The maximum decay heat in any cross sectional region corresponding to the axial length of an Oak Ridge Canister is 55 watts, except that the maximum decay heat in the cross sectional region next to the lid is 35 watts.

Canisters containing intact Peach Bottom fuel elements and Oak Ridge Canisters containing irradiated fuel parts must be loaded into the Oak Ridge Container fuel compartments as follows:

Loading Pattern	One Fuel Compartment	Other Four Fuel Compartments
1	Four Group 2 Canisters	Four Group 1 Canisters
2	Four Group 5 Canisters	Four Group 1 Canisters
3	One Peach Bottom Element and One Group 4 Canister	One Peach Bottom Element and One Group 4 Canister
4	Two Group 3 Canisters and Two Group 4 Canisters	One Peach Bottom Element and One Group 4 Canister

Flux trap spacers, as shown in Transnuclear, Inc. Drawing No. 3044-70-3, must be positioned axially between any two Oak Ridge Canisters.

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5. (c) Criticality Safety Index

Minimum transport index to be shown on  
label for nuclear criticality control:

100

6. The package must be leak tested as follows:

(a) For Configuration 1:

- (1) In the 12-month period prior to shipment and after seal replacement, each containment seal must be tested to show a leak rate no greater than  $1 \times 10^{-3}$  ref-cm<sup>3</sup>/sec. The leak test must have a sensitivity of at least  $5 \times 10^{-4}$  ref-cm<sup>3</sup>/sec.
- (2) Prior to each shipment, the package seals (main seal and vent seal) must be leak tested in accordance with Section 7.1.2 of the Safety Analysis Report. The acceptance criterion is a leak rate no greater than  $1 \times 10^{-3}$  ref-cm<sup>3</sup>/sec. The test must have a sensitivity of at least  $1 \times 10^{-3}$  ref-cm<sup>3</sup>/sec. The drain seal must also be tested if the drain port cover has been removed since the seal was last leak tested.

(b) For Configuration 2:

- (1) In the 12-month period prior to shipment and after seal replacement, each containment seal of the outer cask and the Oak Ridge Container must be tested to show a leak rate no greater than  $1 \times 10^{-7}$  ref-cm<sup>3</sup>/sec. The leak test must have a sensitivity of at least  $5 \times 10^{-8}$  ref-cm<sup>3</sup>/sec.
- (2) Prior to each shipment, the Oak Ridge Container containment seals (main seal and vent seal) and the outer cask containment seals (main seal and vent seal) must be leak tested in accordance with Section 7.1.2 of the Addendum. The seals must show no leakage greater than  $1 \times 10^{-7}$  ref-cm<sup>3</sup>/sec or no leakage when tested to a sensitivity of at least  $1 \times 10^{-3}$  ref-cm<sup>3</sup>/sec. The drain seal of the outer cask must also be tested if the drain port cover has been removed since the seal was last leak tested.

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7. In addition to the requirements of Subpart G of 10 CFR Part 71:
- (a) The package must be prepared for shipment and operated in accordance with the Operating Procedures of Chapter 7 of the Safety Analysis Report for Configuration 1, and Chapter 7 of the Addendum for Configuration 2.
  - (b) Each packaging must meet the acceptance tests and must be maintained in accordance with the Acceptance Tests and Maintenance Program of Chapter 8 of the Safety Analysis Report. In addition, for Configuration 2, each packaging must meet the acceptance tests and must be maintained in accordance with the Acceptance Tests and Maintenance Program of Chapter 8 of the Addendum.
  - (c) Prior to each shipment for Configuration 1 and Configuration 2, the cask main closure seal and vent seal must be inspected. The drain seal must be inspected if the drain port cover has been removed during preparation for shipment. All seals must be replaced within the 12-month period prior to shipment, or earlier if inspection shows any defect. In addition, prior to each shipment for Configuration 2, the Oak Ridge Container main closure seal and vent seal must be inspected. All seals must be replaced within the 12-month period prior to shipment, or earlier if inspection shows any defect.
8. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR 71.12, until October 1, 2004, and under the provisions of 10 CFR 71.17 thereafter.
9. Expiration date: May 31, 2009.

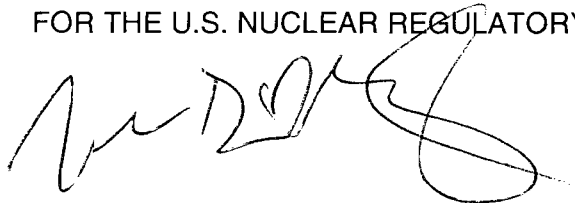
REFERENCES

Public Service Company of Colorado application dated March 31, 1993; as supplemented February 24, June 2, and June 14, 1994; and September 11 and December 7, 1995.

U.S. Department of Energy supplements dated: March 24, 1997; March 24, 1999; June 15, September 18, October 2, 2001, and April 22, 2004.

Transnuclear, Inc. supplements dated September 19, 2001; and March 1, May 17, June 14 and 21, 2002 ; June 3, and July 21, 2003.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION



John D. Monninger, Chief  
Licensing Section  
Spent Fuel Project Office  
Office of Nuclear Material Safety  
and Safeguards

Date: May 21, 2004





UNITED STATES  
NUCLEAR REGULATORY COMMISSION

WASHINGTON, D.C. 20555-0001

May 21, 2004

SAFETY EVALUATION REPORT

Docket No. 71-9253  
Model No. TN-FSV  
Certificate of Compliance No. 9253  
Revision No. 10

**SUMMARY**

By application dated April 22, 2004, the Department of Energy requested renewal of Certificate of Compliance No. 9253, for Model No. TN-FSV. The Department of Energy did not request any changes to the package design or authorized contents. The certificate has been renewed until May 31, 2009.

**EVALUATION**

By application dated April 22, 2004, the Department of Energy requested renewal of Certificate of Compliance No. 9253 for the Model No. TN-FSV package. The Department of Energy did not request any changes to the package design or authorized contents. The staff reviewed the documents referenced in the certificate and determined that the documentation was available and complete. The staff also reviewed the operating and maintenance procedures for the package and found them to be adequate.

Condition No. 5(c) of the certificate was revised to replace the wording "Transport Index for Criticality Control" with "Criticality Safety Index" as defined in 10 CFR 71.4 that becomes effective on October 1, 2004 (69 FR 3698).

Condition No. 8 of the certificate was revised to clarify that the package is approved for use under the general license provisions of 10 CFR 71.12, until October 1, 2004, and under the provisions of 10 CFR 71.17, thereafter. This change is due to a revision in the numbering of the sections in 10 CFR Part 71, that becomes effective on October 1, 2004 (69 FR 3698).

Condition No. 9 of the certificate was changed to reflect the new expiration date.

**CONCLUSION**

The certificate has been renewed with an expiration date of May 31, 2009. This change does not affect the ability of the package to meet the requirements of 10 CFR Part 71.

Issued with Certificate of Compliance No. 9253, Revision No. 10,  
on May 21, 2004